



A qualitative exploration of the shift work experience: the perceived effect on eating habits, lifestyle behaviours and psychosocial wellbeing

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Title page

TITLE

A qualitative exploration of the shift work experience: the perceived effect on eating habits, lifestyle behaviours and psychosocial wellbeing.

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Abstract

Background: Approximately 17% of the European workforce is engaged in shift work. How the experience of shift work impacts on the dietary and lifestyle practices of workers is unclear.

Methods: Fifteen focus groups were conducted by two researchers, with 109 participants. The initial focus group was carried out with both researchers present, to ensure consistency in facilitation. Both researchers thematically analysed all data collected.

Results: Shift work was described as affecting many areas of workers' lives. Three overarching themes were identified; 1) impact on eating behaviour, 2) impact on other lifestyle behaviours including physical activity, sleep, alcohol consumption, smoking and 3) impact on psychosocial health and wellbeing. There appeared to be overlap between the effect of shift work and the effect of individual internal factors in influencing workers' decision-making with regard to lifestyle practices.

Conclusions: Shift work affects many areas of workers' lives, negatively impacting on eating and lifestyle behaviours and psychosocial health. This study augments the current literature as it highlights the role internal motivation plays in workers' lifestyle choices. The research should help inform the development of public health strategies to minimise the impact of shift work, such as specialist behavioural change interventions specific to this group.

Introduction

Approximately 17% of the workforce in Europe is engaged in shift work¹. Shift work is defined as “*any method of organising work in shifts whereby workers succeed each other at the same work stations according to a certain pattern, including a rotating pattern, and which may be continuous or discontinuous, entailing the need for workers to work at different times over a given period of days or weeks*”². This typically involves evening, weekend and rotating shift patterns. Shift work is prevalent across a range of occupational sectors: 24-hour emergency, security and utility services, production lines, leisure and entertainment industries and when working across time zones.

Shift work typically leads to an altered routine; such disruption can lead to changes in circadian rhythms. These biological rhythms normally adhere to a 24-hour cycle and regulate behavioural, endocrine and neurophysiological processes such as sleep-wake cycles, body temperature, blood pressure and the release of several hormones. When sleep patterns are out of synchrony with light and dark, as can occur in shift work, circadian rhythms may become disrupted.

Abnormal circadian rhythms appear to have adverse implications for health. Moreover, eating at night can alter glucose metabolism³. Internationally, studies have reported higher risk of overweight/obesity⁴⁻⁶, metabolic syndrome⁷, type 2 diabetes mellitus⁸, cardiovascular diseases^{9,10}, cancers¹¹⁻¹³, particularly breast and colorectal, and gastrointestinal disorders¹⁴ in shift workers compared to those working standard hours. However, inconsistencies surrounding definitions of shift work and shift work exposure exist¹⁵, making the true health risk attached to shift work difficult to ascertain. Poor dietary and/or lifestyle behaviours may potentiate the problem. Shift workers are reported to have poorer quality diets^{16,17}, irregular eating patterns^{6,18,19}, higher alcohol consumption²⁰⁻²² and smoking rates^{23,24}, and less physical activity^{20,25}. Up to 30% are reported to suffer from a sleep disorder²⁶. Few studies exist which qualitatively explore how and why shift work impacts on lifestyle. To develop effective lifestyle interventions for this group, insight into how and why shift work influences lifestyle habits is required.

Subjects and Methods

Study design

The aims of this research were to qualitatively explore the shift work experience and the impact of shift work on dietary and lifestyle practices in shift workers living in Ireland.

Fifteen semi-structured focus groups (FGs) were conducted, with a total of 109 participants.

Topics integral to the aim of the study were discussed while facilitating the identification and consideration of unforeseen or overlooked issues. FGs included 5-12 participants (mean of 7) per group. Nine FGs took place in the Republic of Ireland (ROI) and six in Northern Ireland (NI). FGs in ROI and NI were carried out by two separate researchers. The initial FG was carried out with both researchers present to ensure consistency in FG facilitation. To ensure quality control, both researchers analysed all data collected in each jurisdiction.

Ethical approval was received from the Ethics Committee at the Dublin Institute of Technology (DIT), Ireland; the application and approval from the DIT was agreed to by the University of Ulster Research Ethics Committee. All participants were provided with a study information sheet and a verbal explanation of the study was also given at the start of each FG. Participants had the opportunity to ask questions or to withdraw from the study. Written informed consent was given by each participant.

Recruitment of participants

Participants were recruited based on sector of employment and geographical location. The three largest sectors employing shift workers in Ireland were targeted; accommodation and food services (AFS; n=5 FGs), health and social care (HSC; n=6 FGs) and manufacturing/industry (M/I; n=4 FGs). Specific occupational roles within each group varied, with a mix of manual versus sedentary roles, often reflective of grade of employment rather than employment group. The overall sample was broadly representative of the ROI and NI, rural/urban location, gender, age and public/private sector employment. Each group was comprised of employees (M/F; 18+ years old) from the same organisation. A designated person of authority at each organisation disseminated information on the study to employees. Participants were offered a gift voucher valued at £15/€20 as a discretionary honorarium for participating.

Focus group discussion guide

Discussion points for the FGs were based on the published literature identified during an extensive literature review¹³. The draft discussion guide was piloted with HSC workers in ROI (n=6), with both facilitators present. The finalised discussion guide (Table 1) allowed for discussion of issues of particular importance to each group as they arose.

Insert Table 1

Data collection and analysis

FGs took place within each workplace in a quiet space. FG discussions were recorded using a digital dictaphone; each lasted between 40 and 70 minutes. Participants' demographic and household characteristics, lifestyle practices and work patterns were obtained using a short

questionnaire, the key elements of which are summarised in Table 2, before starting the group discussion. Rotating shift work was defined as any work pattern when the participant alternated between day, afternoon or night shifts, as opposed to fixed shifts. FG recordings were professionally transcribed verbatim and individual/company names removed to protect anonymity. The transcripts were compared to FG recordings to ensure accuracy. Transcripts were imported into the qualitative data analysis software package, Nvivo 10²⁵. An inductive thematic analysis procedure²⁶ was applied to the data to identify common themes. Initially, transcripts were read repeatedly and initial trends within the data generated. Two researchers independently and systematically coded the transcripts, and then discussed the codes to verify their application to the data. Overarching themes and sub-themes were identified. Both researchers reached consensus on the assignment of all themes (inter-rater reliability equal to 1.00) and extracted quotations to illustrate typical views.

Insert Table 2

Results

The demographic profile of the 109 participants is presented in Table 3. The sample population was composed of 65 males and 44 females, aged between 18-64 years. Almost half (48%) were overweight or obese based on self-reported height and weight, while 30% were physically active once or less weekly. Three overarching themes were identified; 1) impact of shift work on eating behaviour, 2) impact of shift work on lifestyle behaviours including physical activity, alcohol consumption, smoking and sleep and, 3) impact of shift work on psychosocial health and wellbeing. An overlap was observed between the effects of shift work and the effects of internal factors specific to the individual, such as motivation level, on participants' decision-making about their lifestyle practices.

Insert Table 3

Theme 1: the effects of shift work on eating behaviours

A number of sub-themes were identified within this theme (Table 4). There was consensus that shift work has negative consequences for dietary habits, predominantly related to its impact on eating patterns and on the nutritional quality of foods consumed.

Impact of shift work on meal pattern and snacking

The FG discussions indicated that eating patterns were heavily influenced by shift work (Table 4). Eating habits were described as “irregular”, “erratic” and “rushed”. Some made efforts to maintain their perceived “normal” eating patterns during daytime hours (i.e. breakfast, lunch and dinner at standard UK/Irish eating times) and to minimise night-time eating. Difficulty planning healthy meals and maintaining a regular meal pattern was most

commonly due to an inconsistent routine “*your routine is completely gone*”, a lack of time to purchase groceries and prepare food “*I don’t have enough time to prepare anything*” and work-related tiredness “*when I go home from shift work I’m too tired*”. Meal skipping or long gaps between meals were common, with a “*feast and famine*” type pattern of eating frequently reported. Many workers expressed frustration at the difficulty of matching appetite to opportunity to eat. This led to viewing food as fuel and eating for the sake of eating, consuming a large meal before work as a break was not guaranteed, followed by a long period without eating during working hours. Many reported “*the tiredness can be quite nauseating*”; thus, loss of appetite was encountered, particularly during or coming off night shifts. This further compounded erratic eating patterns. Typically, this “*famine*” period resulted in poor dietary choices later with hunger-driven food binges of processed convenience or takeaway foods often relied upon. Many workers acknowledged that snacking increased as a consequence of skipped meals. High energy snacks such as crisps, chocolate and biscuits were typically chosen because they provided a “*quick fix...because you haven’t eaten in so long*”.

Impact of shift work on diet quality

Many workers believed that dietary quality was adversely affected by shift work (Table 4). Over-reliance on convenience or takeaway foods, due to lack of time or energy for meal preparation and/or eating, or to poor availability of healthy options within the workplace environment, and heavy reliance on coffee to stay alert during long or night shifts were reported. Difficulty shopping when working a long day shift, with takeaways eaten as a consequence, was discussed. Some workers expressed frustration that despite bringing healthy meals to work, this effort was hampered due to missing or disturbed break times.

Impact of individual internal factors on eating behaviour

While it was evident that shift work was important in dictating what and when workers eat, individual internal factors, such as motivation to eat healthily, were also apparent (Table 4). Many justified poorer dietary choices on the basis that they were working shift work, or that they “*deserve*” a reward. This was compounded by the self-rewarding behaviours of colleagues, making it necessary to eat unhealthily in order to conform. A small number highlighted the positive effect of shift work on eating behaviours, stating that they had more control over what they ate due to limited access to food and restricted eating times within the workplace environment. Some described how shift work forced them to become more organised when planning meals; these would batch cook meals perceived as healthy in advance.

Insert Table 4

Theme 2: the effects of shift work on other lifestyle behaviours

Physical activity

Workers expressed mixed opinions on the impact of shift work on their ability to participate in physical activity (Table 5). Occupational activity was also discussed; while many workers were on their feet or active for much of their shift, occupational activity levels varied dependent on workers' specific roles. There was consensus that occupational activity is the wrong type of activity, as it does not provide a cardiovascular workout or increase fitness levels. Those who engaged in regular physical activity described better recovery from shift work and improved sleep. Individual internal factors, such as motivation to improve or maintain health, again appeared to affect workers' motivation to exercise.

Alcohol consumption

Opinions were also mixed about the effect of shift work on alcohol consumption (Table 5). For some, shift work lead to reduced alcohol consumption, due to a mismatch of work and social occasions involving alcohol. Some purposely avoided alcohol, as a hangover would compound the tiredness already experienced from shift work. However, some workers stated that their drinking at home increased. Others required alcohol to help them sleep when coming off shift and would have "*a glass of wine to go to sleep... to relax*". Alcohol consumption was perceived by those in the AFS sector as higher among their group, due to the social nature of working in this sector and the ready availability of alcohol in the workplace environment.

Smoking

A small number of workers described how smoking influenced their eating behaviour "*to stop you eating rubbish...you would smoke*". For some, smoking allowed them a break from work that they may otherwise not get. Others stated that their workload did not lend itself to taking smoking breaks (Table 5).

Sleep

Workers across all groups unanimously agreed that shift work impacted negatively on both sleep quality and quantity (Table 5). For some, their shift pattern did not allow for adequate rest between shifts. Particular difficulty was reported with trying to sleep when coming off night duty, or when rotating between day and night shifts. Difficulty getting to sleep, due to a need to "*wind down*", was particularly problematic for those working in a noisy or chaotic environment. Staying asleep was also an issue, especially when trying to sleep during the

day, due to daylight and noise. Many reported that they accept poorer sleep as part of shift work.

Insert Table 5

Theme 3: the effects of shift work on psychosocial health

Social and family life

Social and family life was affected by shift work (Table 6). A mismatch of routine with those around them resulted in difficulty maintaining relationships for some. Frequently missing social gatherings was difficult for many. For some, working shifts meant giving up team sports and missing out on the associated social aspects. Others, however, found a new social outlet by meeting up with workmates during time off.

The impact on family life was strongly expressed. For some, the stress of shift work created a strain on relationships. Missing special occasions was particularly difficult, especially for those with children. Difficulty tending to the needs of the family was expressed, mostly due to lack of time or tiredness related to shift work. Females, in particular, expressed guilt about not being there for their families. The negative impacts were accepted because more money was earned compared to working standard hours. A small number described a positive effect on family life; working shifts allowed them time during the day to complete household errands and attend appointments, and more time off that could be spent with children which decreased childcare needs. For some, these positive aspects offset the adverse effects of working shifts. Achieving a balance between shift pattern and particular family/personal circumstances was evident.

Mood

Many workers experienced feelings of isolation due to working anti-social hours. In conjunction with poor sleep, this had a negative effect on mood with implications for mental health (Table 6). Work-related stress was reported, particularly in HSC groups, with this also affecting them outside working hours. Reduced exposure to daylight was also perceived to influence mood.

Insert Table 6

Discussion

Main findings of this study

This study is the first to qualitatively explore the day-to-day and longer-term impact of shift work on the lifestyle behaviours of shift workers across a range of employment sectors in Ireland. Overall, shift workers perceive that shift work impacts on many aspects of their lives.

The effect on diet was predominant, with further discussions centring around the effect on other lifestyle behaviours and psychosocial wellbeing.

Shift workers perceive that their work pattern impacts negatively on their eating routine and on the nutritional quality of their diets. Erratic eating patterns were a predominant feature of the diets of many workers, with meal skipping and increased snacking common. Although many brought meals from home in an effort to eat healthily, elements of the job meant that they either got insufficient breaks in which to eat, or breaks were disturbed resulting in food becoming spoiled; this left many feeling powerless to improve their eating habits. Energy dense and sugary snacks typically compensated for disrupted meals; examples identified by participants included “*chocolate*”, “*chips*”, “*fast food*”, “*biscuits*”, “*cakes*” and named brand soft drinks. Some made efforts to be “*good*” on days off owing to better structure and routine; for others, however, days off were seen as a “*treat*” and a licence to eat poorly.

Both sleep and physical activity were also negatively influenced by shift work, but the effects of shift work on alcohol consumption were mixed. The psychosocial impact of shift work was apparent, with negative implications for both social and family life and subsequent effects of this on mood. Sleep was frequently disrupted, and the negative impact of shift work on sleep patterns was unanimous. Sleep was particularly badly affected for those on rotating shifts or when coming off a period of night shifts. Most stated they were not in one shift system long enough to adjust before their routine was altered again. Broken, poor quality sleep was a source of frustration for many; workers often woke not feeling rested. Sleep was prioritised above all other activities after a shift, including eating. Many would like guidance on improving sleep patterns to benefit their health. Catching up on sleep during days off also had a negative impact on routine and led to many viewing food as fuel, eating for the sake of eating. This altered view of food removed the enjoyment from eating, and eating on the run or in isolation removed the social aspect attached to eating. For some, shift work prevented social drinking, due to the anti-social nature of atypical working hours. In contrast, due to the social nature of their work environment and the ready availability of alcohol, many in the AFS sector admitted drinking heavily with colleagues after work. Other shift workers described drinking at home either with family or in isolation to relax either after work or on days off.

What is already known on this topic

The results of this study support findings from previously published studies which report that shift work affects the distribution of energy intake, namely a decrease in hot meals and an increased frequency of snacking^{6, 19,29,30}. There is evidence to show that eating whilst on shift

work, particularly during the night shift, is driven more by scheduling constraints than by actual hunger²⁹; this theory is supported by the present study findings. This mindless eating may have a negative psychological impact on the eating experience. Eating alone is a risk factor for depressive symptoms³¹ as well as being associated with unhappiness³². Missing out on the social aspects of mealtimes may increase risk for mental health issues, particularly important in the context of anti-social working hours. The heavy reliance on convenience/processed snack foods, at the expense of fresh and unprocessed foods, concurs with previously published literature which reports increased intake of saturated fat¹⁶ and processed foods³³, and decreased intake of fruit, vegetables³³ and dietary fibre³⁴ after commencing shift work. In addition, lower intakes of vitamins A, D and E, and zinc have been documented among shift workers, relative to day workers¹⁷. There are three previous qualitative studies investigating the impact of shift work on the diet; two were in nurses (in Sweden³⁵ and South Africa³⁶) and one in Australia firefighters³⁷. In all studies, disruption to circadian rhythms had a negative influence on workers' dietary choices. Choosing unhealthy or takeaway foods due to convenience, long working hours, peer-pressure or as a means to stay awake at night were apparent. Occupational stress influenced eating habits with many snacking throughout the day as a coping strategy³⁶. The workplace environment itself influenced eating habits, with the food available reported as being predominantly unhealthy^{36,37}. In addition, lifestyle habits were influenced both positively and negatively by work colleagues^{35,37}. Workers perceived that shift work has an impact on their dietary and lifestyle habits outside of working hours³⁷, with irregular eating habits continuing into days off due to circadian disruption, and many refraining from exercise during time off in favour of sleep³⁵.

Previous studies on activity levels among shift workers have produced equivocal results, possibly owing to varying definitions of activity (e.g. total physical activity, occupational activity or planned structured leisure time activity) and different measures to record activity¹⁵. Shift work may reduce long-term adherence to leisure time physical activity owing to altered biological responses to exercise which result in changes in perceived exertion during exercise³⁸. Many in this study avoided exercise during the day before a night shift in order to preserve energy, or following a night shift in order to catch up on rest. Similar sentiments were reported by the Swedish nurses³⁵. All studies report a fine balance between having enough time for rest, family, household and social commitments, and activity. The psychosocial health and wellbeing of many shift workers was negatively affected by their shift patterns. Complaints about work-life balance are the main cause of maladaptation

to shift work and influence the development of psychosomatic disorders³⁹. Due to the unpredictable and unconventional working hours associated with shift work, workers' social and family lives were frequently and adversely affected. Conflict between work and family life has previously been reported among shift workers, with work demands and a lack of family time having a negative influence on marital relationships, parental roles and children's education³⁹. In the qualitative study of South African nurses, shift work negatively affected participants' ability to tend to family responsibilities, causing high levels of stress, which may impact on mental health³⁶. Qualitative work with Iranian nurses reported night shift work had negative socio-cultural impacts as it detracted from expected duties within the family home⁴⁰.

What this study adds

This study augments the current literature in that it highlights the important role of internal motivation in shift workers' lifestyle choices. Shift work can be used as an excuse for less healthy dietary choices; it was "*easy to blame shift work*" and use shift work to justify unhealthy behaviours. Those who were less motivated to lead a healthy lifestyle appeared to believe that the negative influence of shift work on their lifestyle was beyond their control, and were less likely to make attempts to negate this influence. Individuals differ in their tolerance to shift work, with some developing better coping mechanisms than others. Internal motivation to improve health decreases the likelihood of shift work adversely influencing lifestyle behaviours. Acknowledging the role of internal motivation can inform the development of public health strategies to minimise the impact of shift work, and identify specialist interventions tailored to help facilitate healthier choices in this group. Furthermore, explanations offered on how physical activity was affected by shift work may shed light on the differences in previous study results. As team sports and exercise classes are generally at convenient times for those working standard hours (in UK/Ireland, this is typically Monday to Friday, 09:00 to 17:00), these are often not an option for shift workers, who must undertake physical activity alone. Extra motivation was required to "*force*" engagement in activity. Participation was influenced by workers' other commitments such as childcare and household duties, and by their internal motivation to be active and improve health.

Limitations of this study

This study includes only participants from the three largest sectors employing shift workers in Ireland and findings may not be applicable to other groups of shift workers. The research quality of qualitative research is dependent on the skills of the researcher and can be influenced by the researcher's personal approach. The effect of this was minimised by using

365 two researchers who developed a standardised approach and independently analysed the data.

366 The findings of this qualitative study should be substantiated by a large quantitative study.

367 Internal motivation to make lifestyle changes and improve health is complex, and may

368 require specialist behavioural change interventions to overcome barriers.

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References

1. Eurofound. Fifth European Working Conditions Survey. Publications Office of the European Union, Luxembourg; 2012.
2. European Parliament and Council of The European Union (2000) Directive 2000/34/ EC of the European Parliament and of the Council of 22 June 2000 amending Council Directive 93/104/ EC Concerning Certain Aspects of the Organization of Working Time to Cover Sectors and Activities Excluded from that Directive, (01/08/2000). Official Journal of the European Communities No. L 195/41. Luxembourg: European Union.
3. Grant CL, Coates AM, Dorrian J et al. Timing of food intake during simulated night shift impacts glucose metabolism: A controlled study. *Chronobiology International*. 2017;34(8):1003-13.
4. Antunes LC, Levandovski R, Dantas G et al. Obesity and shift work: chronobiological aspects. *Nutrition Research Reviews*. 2010;23(1):155-68.
5. Zhao I, Bogossian F, Turner C. Does maintaining or changing shift types affect BMI? A longitudinal study. *Journal of Occupational and Environmental Medicine*. 2012;54(5):525-31.
6. Bonham, MP, Bonnell EK, Huggins CE. Energy intake of shift workers compared to fixed day workers: A systematic review and meta-analysis. *Chronobiology International*. 2016;33(8):1086-1100.
7. Wang F, Zhang L, Zhang Y et al. Meta-analysis on night shift work and risk of metabolic syndrome. *Obesity Reviews : an official journal of the International Association for the Study of Obesity*. 2014;15(9):709-20.
8. Pan A, Schernhammer ES, Sun Q et al. Rotating night shift work and risk of type 2 diabetes: two prospective cohort studies in women. *PLoS Medicine*. 2011;8(12):e1001141.
9. Haupt CM, Alte D, Dorr M et al. The relation of exposure to shift work with atherosclerosis and myocardial infarction in a general population. *Atherosclerosis*. 2008;201(1):205-11.
10. Brown DL, Feskanich D, Sanchez BN et al. Rotating night shift work and the risk of ischemic stroke. *American Journal of Epidemiology*. 2009;169(11):1370-7.
11. International Agency for Research on Cancer. Painting, firefighting, and shiftwork. IARC monographs on the evaluation of carcinogenic risks to humans / World Health Organization, International Agency for Research on Cancer. 2010;98:9-764.

12. Wang F, Yeung KL, Chan WC et al. A meta-analysis on dose-response relationship between night shift work and the risk of breast cancer. *Annals of Oncology : official journal of the European Society for Medical Oncology (ESMO)*. 2013;24(11):2724-32.
13. Kamdar BB, Tergas AI, Mateen FJ et al. Night-shift work and risk of breast cancer: a systematic review and meta-analysis. *Breast Cancer Research and Treatment*. 2013;138(1):291-301.
14. Knutsson A, Boggild H. Gastrointestinal disorders among shift workers. *Scandinavian Journal of Work, Environment & Health*. 2010;36(2):85-95.
15. Nea FM, Kearney J, Livingstone MB et al. Dietary and lifestyle habits and the associated health risks in shift workers. *Nutrition Research Reviews*. 2015;28(2):143-66.
16. Nikolova N HS, Angelova K. Nutrition of night and shift workers in transports. In: G C, editor. *Shiftwork: health, sleep and performance*. Frankfurt am Main (Germany): Peter Lang; 1990. p. 583-7.
17. Linseisen J, Wolfram G. [Nutrient intake in permanent night shift workers]. *Zeitschrift für Ernährungswiss.* 1994;33(4):299-309.
18. Pasqua IC, Moreno CR. The nutritional status and eating habits of shift workers: a chronobiological approach. *Chronobiology International*. 2004;21(6):949-60.
19. de Assis MAA, Kupek E, Nahas MV et al. Food intake and circadian rhythms in shift workers with a high workload. *Appetite*. 2003;40(2):175-83.
20. Bushnell PT, Colombi A, Caruso CC et al. Work schedules and health behavior outcomes at a large manufacturer. *Industrial Health*. 2010;48(4):395-405.
21. Morikawa Y, Sakurai M, Nakamura K et al. Correlation between shift-work-related sleep problems and heavy drinking in Japanese male factory workers. *Alcohol Alcohol*. 2013;48(2):202-6.
22. Morikawa Y, Nakamura K, Sakurai M et al. The Effect of Age on the Relationships between Work-related Factors and Heavy Drinking. *Journal of Occupational Health*. 2014;56(2):141-9.
23. Cho YS, Kim HR, Myong JP et al. Association between work conditions and smoking in South Korea. *Safety and Health at Work*. 2013;4(4):197-200.
24. Nabe-Nielsen K, Garde AH, Tuchsén F et al. Cardiovascular risk factors and primary selection into shift work. *Scandinavian Journal of Work, Environment and Health*. 2008;34(3):206-12.
25. Siedlecka J. Selected work-related health problems in drivers of public transport vehicles. *Medycyna Pracy*. 2006;57(1):47-52.

26. Gumenyuk V, Roth T, Drake CL. Circadian phase, sleepiness, and light exposure assessment in night workers with and without shift work disorder. *Chronobiology International*. 2012;29(7):928-36.
27. QSR International Pty Ltd (2012) Nvivo qualitative methods analysis (Version 10) [Computer Qualitative Data Analysis Software]. Doncaster, Victoria, Australia: QSR International Pty Ltd. Retrieved August 2nd 2017 from <http://www.qsrinternational.com>
28. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*. 2006;3(2):77-101.
29. Waterhouse J, Buckley P, Edwards B et al. Measurement of, and some reasons for, differences in eating habits between night and day workers. *Chronobiology International*. 2003;20(6):1075-92.
30. Lowden A, Moreno C, Holmbäck U et al. Eating and shift work - effects on habits, metabolism and performance. *Scandinavian Journal of Work, Environment and Health*. 2010;36(2):150-62.
31. Kuroda A, Tanaka T, Hirano H et al. Eating Alone as Social Disengagement is Strongly Associated With Depressive Symptoms in Japanese Community-Dwelling Older Adults. *Journal of the American Medical Directors Association*. 2015;16(7):578-85.
32. Yiengprugsawan V, Banwell C, Takeda W et al. Health, happiness and eating together: what can a large Thai cohort study tell us? *Global Journal of Health Science*. 2015;7(4):270-7.
33. Hemio K, Puttonen S, Viitasalo K et al. Food and nutrient intake among workers with different shift systems. *Occupational and Environmental Medicine*. 2015.
34. Knutson A, Andersson H, Berglund U. Serum lipoproteins in day and shift workers: a prospective study. *British Journal of Industrial Medicine*. 1990;47(2):132-4.
35. Persson M, Martensson J. Situations influencing habits in diet and exercise among nurses working night shift. *Journal of Nursing Management*. 2006;14(5):414-23.
36. Phiri LP, Draper CE, Lambert EV et al. Nurses' lifestyle behaviours, health priorities and barriers to living a healthy lifestyle: a qualitative descriptive study. *BMC Nursing*. 2014;13(1):38.
37. Bonnell EK, Huggins CE, Huggins CT et al. Influences on Dietary Choices during Day versus Night Shift in Shift Workers: A Mixed Methods Study. *Nutrients* 2017;9(3):193.
38. Atkinson G, Fullick S, Grindey C et al. Exercise, energy balance and the shift worker. *Sports Medicine*. 2008;38(8):671-85.

- 470 39. Costa G. Shift work and occupational medicine: an overview. Occupational Medicine
471 (Lond). 2003;53(2):83-8.
- 472 40. Nasrabadi AN, Seif H, Latifi M et al. Night shift work experiences among Iranian nurses:
473 a qualitative study. International Nursing Review. 2009;56(4):498-503.
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476 **Figure legends**

477 None

478

479 **Table headings**

480 **Table 1**

481 Focus group discussion guide

482

483 **Table 2**

484 Questions on demographic and lifestyle practices

485

486 **Table 3**

487 Demographic characteristics of focus group participants (n = 109)

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489 **Table 4**

490 The effects of shift work on eating behaviours

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492 **Table 5**

493 The effects of shift work on lifestyle behaviours

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495 **Table 6**

496 The effects of shift work on psychological health

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Table 1. Focus group discussion guide

Introduction and ice-breaker	
1: Dietary practices	How would you describe your attitude to healthy eating? How important is health to you? How do you feel about your diet? Which factors influence how you manage your diet? How much control do you feel you have over your diet? (and why?) How do you find managing your diet while working shift work? (<i>if not already identified as an influencing factor</i>) How would you describe your eating patterns when you are working? How would you describe your eating patterns on days off?
2: Other lifestyle practices	Are there any other areas of your life that are affected by your working patterns? (<i>Explore only those that come up in depth</i>) e.g.: Exercise; smoking; alcohol intake; sleep; food choice; mood/stress; relationships; quality of life
3: Effects of different shift work patterns	<i>For those who work different patterns of shift work</i>), do different shift patterns affect your lifestyle in different ways? How so?
4: Work place environment	Tell me about your work place environment What facilities are available to you at meal times in your work place? Describe the selection and availability of foods at your work place How supportive do you feel your workplace environment is of healthy eating? Thinking back to other places you may have worked previously, what do you think makes a work environment supportive (or not) of healthy eating?
5: Perceived barriers to a healthier lifestyle for shift workers	Can you identify any barriers you find to leading a healthier lifestyle? Do you think these barriers are within your personal control? Do you feel you have the knowledge and information to overcome these barriers? Have your working patterns ever affected (positively or negatively) your attempts to lead a healthier lifestyle?
6: Opportunities for a healthier lifestyle among shift workers	What motivates you to improve your lifestyle? Do you have any suggestions for overcoming the discussed barriers (if any) to a healthier lifestyle? What do you feel could work for you personally or for your work place as a whole? Have you any experience (positive, negative or otherwise) of work place initiatives for improving employee health?

7: Prospective health communication for shift workers	In terms of managing your diet and lifestyle, are there any aspects you feel you need more information on? What form would you like to see this information in? (e.g. leaflet, poster, social media)
Opportunity for participants to raise any other relevant issues	
Close of discussion	

Table 2. Questions on demographic and lifestyle practices

Details about you	Gender: male/female Age group: 18-25; 26-35; 36-45; 46-55; 56-64 Height (without shoes) Weight Marital status: single (never married); living with partner; married; divorced/separated; widowed Highest level of education attained: none; primary school; secondary school to age 15/16; secondary school to age 17/18; additional training (e.g. apprenticeship schemes); undergraduate university; postgraduate university Current shift work pattern: full-time/part-time Day; night; rotating Number of shifts per week Number of hours per week Most recent occupation Smoker: current; ex; never Over the last year, have you tried to: lose weight; eat less fat; eat more fruits and vegetables; take more exercise Special diet: no; diabetic; cholesterol lowering; slimming diet prescribed by healthcare professional/self; vegetarian; vegan; other medical diet Physical activity per week: less than once; once a week; 2-3 times a week; 4-5 times a week; 6 times a week or more Amount of time spent per session of physical activity Type of physical activity
Details about your household	Number of people living in household: live alone; two; three; four; five (+) Who is lived with: parent(s); partner(s); daughter(s)/son(s); brother(s)/sister(s); other(s) Household reference person (owns/rents accommodation or highest income): self; partner; parent Occupation of household reference person (if other than self) Employment status of household reference person (if other than self): full-time; part-time; home-maker; not employed; student; never worked Responsibility for food and grocery shopping: most; joint; done by someone else Responsibility for meal preparation/cooking: most; joint; done by someone else

Table 3. Demographic characteristics of focus group participants (n = 109)

Demographics	n= (%)	Demographics	n= (%)
Gender		Smoking status	
Male	65 (59.6)	Current smoker	17 (15.6)
Female	44 (40.4)	Ex-smoker	36 (33.0)
Age range		Never smoked	53 (48.6)
18-25	18 (16.5)	Unspecified	3 (2.8)
26-35	34 (31.2)	Frequency of physical activity	
36-45	25 (22.9)	<once per week	23 (21.1)
46-55	27 (24.8)	Once per week	10 (9.2)
56-64	4 (3.7)	2-3 times per week	39 (35.8)
Unspecified	1(0.9)	4-5 times per week	25 (22.9)
Nationality		≥6 times per week	8 (7.3)
Irish / Northern Irish	88 (80.7)	Unspecified	4 (3.7)
Other	20 (18.3)	Those who have made an attempt in the last year to:	
Unspecified	1 (0.9)	Lose weight	51 (48.1)
Marital Status		Eat less fat	61 (57.5)
Single	40 (36.7)	Eat more fruit and vegetables	70 (66.0)
Living with partner	13 (11.9)	Take more exercise	79 (74.5)
Married/civil partnership	52 (47.7)		
Divorced/separated	3 (2.8)		
Widowed	1 (0.9)		
Highest education level			
Secondary school to age 15/16	6 (5.5)		
Secondary school to age 17/18	14 (12.8)		
Additional training	35 (32.1)		
Undergraduate university	35 (32.1)		
Postgraduate university	19 (17.4)		
% with experience of types of shift work			
Day shift	39 (48.1)#		
Night shift	38 (47.5)#		
Rotating shift	56 (69.1)#		
Employed full time / part time			
Full time	94 (86.2)		
Part time	11 (10.1)		
Unspecified	4 (3.7)		
BMI (kg/m²)*			
<18.5 kg/m ²	1 (0.9)		
18.5 - 24.9 kg/m ²	43 (39.4)		
25.0 - 29.9 kg/m ²	38 (34.9)		
>30 kg/m ²	14 (12.8)		
Unspecified	13 (11.9)		

#A large proportion of participants did not answer this question (n=28) so results are presented as valid percentages

*BMI based on self-reported height and weight

Table 4. The effects of shift work on eating behaviours

Theme 1: the effects of shift work on eating behaviours	
Sub-theme	Representative quotes
Impact of shift work on meal pattern and snacking	<p>"I often don't eat breakfast. Just dinner, that's the main kind of, the whole day. The one main meal a day and then snacks in between...coffee." (HSC worker)</p> <p><i>"...I just skip lunch and just have a coffee and a bit of toast and then I'd then be starving and by the time I get home but inevitably you're tired I'd just get a Chinese [takeaway] or something on the way back."</i> (HSC worker)</p> <p>"I find personally I munch more on a night shift than I would on a day shift (...) there's temptation around every corner, you know what I mean" (M/I worker)</p> <p><i>"...sometimes you don't get a chance of eating healthy food because you're working and you don't get the same... you know, the same time or you're just too busy, you just pick and eat all the things you shouldn't be eating"</i> (AFS worker)</p>
Impact of shift work on diet quality	<p>"if you're working on the weekend it's normally pub grub across the road or [named fast food chain]. Or else if you're on night duty it's takeaways" (HSC worker)</p> <p><i>"Night shift, well that's a totally different matter, you've buns, biscuits, steal them out of the fridge, and then ham, cheese and toast and sausages and chips because that's – because it's there, it's easy and it's readily available"</i> (AFS worker)</p> <p>"And I think that I've been doing loads of coffee and tea which is not very healthy (...) I'll have several cups of coffee that'll keep me going" (HSC worker)</p> <p><i>"...some days during the week you're getting a takeaway or you're doing things that are easy and quick"</i> (HSC worker)</p> <p>"So you're continuously leaving your food behind you, and then eventually you just get sick of looking at it...then that's when you'll hit the machine when you're hungry for a bar of chocolate to keep you going because you haven't had time to eat" (HSC worker)</p>
Impact of individual internal factors on eating behaviour	<p>"It's really what you want to do with it...it's a choice. (...) I'd have had the chef, particularly at this time of year, would've, you know, made up platters of sandwiches and kept containers of soup over which you would deem as the healthy option, but they [younger staff] didn't touch them, they went to the pizza place instead or went to [named fast food restaurant], that's what they wanted to do. It's really your own choice and mind set what you really want to do." (AFS worker)</p> <p><i>"...sometimes say ah sure it's ok I'm on nights, I can have one [in reference to fast food/food from vending machine], let myself go like"</i> (M/I worker)</p> <p>"Someone will bring in cake on Saturdays, everyone feels sorry for themselves working on Saturday. So you're pulled in to have cake" (HSC worker)</p> <p><i>"...otherwise you're having to get up and think about cooking...So I cook on a Monday, I cook 4 or 5 portions of things and just freeze them all so I might have 2 or 3 weeks of stuff in the freezer at any one time"</i> (MI worker)</p>

Table 5. The effects of shift work on lifestyle behaviours

Theme 2: the effects of shift work on lifestyle behaviours	
Sub-theme	Representative quotes
Physical activity	<p>“I used to take a, a martial arts class on a Monday (...) but because you’d have you know a run of weeks where you’d be say on in the working late on a Monday and then like say we’d be on nights and you go, “Well there’s no point going the week in between” and it just sort of falls apart.” (HSC worker)</p> <p><i>“I think if you’re just working Monday to Friday 9:00am – 5:00pm I would be doing less [exercise] because you’ve been at home at night and you’re coming to that time in the evening you want to wind down (...) But when you, you’ve more time to yourself to exercise, walk and do outdoor activities if you’re working shift patterns...” (HSC worker)</i></p> <p>“I think you’re constantly moving but you’re not actually fit, that’s what it is... You’re not fit, I’m so unfit it’s insane and I constantly walk here, 50, 60 hours like.” (AFS worker)</p>
Alcohol consumption	<p>“I find I drink far less... if I’m off four days during the week, I won’t have a drink at all, because all my friends work Monday to Friday so I wouldn’t have a drink on my own... When I was working Monday to Friday, I’d be out every weekend” (M/I worker)</p> <p><i>“To be really honest, like hospitality is quite a sociable industry, you know, and we... Because we were working in the bars, you know, we would do quite a lot of drinking” (AFS worker)</i></p>
Smoking	<p>“...it’s very hard to smoke I’d say if you’re working (...) If you were a heavy smoker disappearing every hour at nights, then it would be like that guy is doing nothing.” (HSC worker)</p>
Sleep	<p>“I’m working now ‘til ten o’clock tonight and I’m in at half five tomorrow morning ... we don’t get out at ten, you know yourself, it could be half ten, by the time you get home it’s eleven o’clock, time you maybe make something to eat for yourself (...) before I know it I’m up at a quarter to five in the morning and into work for half five” (AFS worker)</p> <p><i>“Because when you come off, when you do night duty as well, you’re sleeping pattern is all interfered with so the morning you come off nights, you’re trying, you want to go to bed and you want to sleep but you have to stay awake for a long period of time because you’re going to be going to bed that night.” (HSC worker)</i></p> <p>“If you get 4 hours during the day that’s considered a decent amount of sleep.” (M/I worker)</p>

Table 6. The effects of shift work on psychosocial health

Theme 3: the effects of shift work on psychosocial health	
Sub-theme	Representative quotes
Social and family life	<p>“...when I was younger, you’d get involved in clubs, again shift work doesn’t lend itself to getting involved with things.” (M/I worker)</p> <p><i>“You might miss the Christmas concert, and there’s nothing you can do about it”; “You know you miss their birthdays, you genuinely do”; “Christmas is dreadful” (HSC workers)</i></p> <p>“...what will my kids be like, like I won’t be there on a Tuesday, Wednesday, Friday so will they be getting pizza on a Tuesday just because I’m not there...” (HSC worker)</p>
Mood	<p>“You’re feeling tired. You’re more grumpy if you’re tired...stuff that wouldn’t annoy you normally if you were off, but agitates you on day three or day four, when you’re tired and your sleep pattern’s been disrupted, it goes hand in hand...”</p> <p><i>“I’m sure our other halves can all tell when we’re working and when we’re off, that’s for sure...it’s like we’re different people.” (M/I workers)</i></p> <p>“You know you’re in bed, the curtains are drawn like so you’re in the dark during the day as well, you go to work you’re in the dark”;</p> <p>“Yeah, there is a certain amount of, you can get affected by that” (M/I workers)</p>
Positive aspects	<p>“...you’ve days off during the week or whatever. It has its plus and minuses...bring your kids to school and collect them on days off” (HSC worker)</p> <p><i>“You know we’d have a request book so maybe there’s a particular hospital appointment or something that you need to be off for...and generally that request is upheld. So that does make working in this work environment easier” (HSC worker)</i></p> <p><i>“When you’re here you’re here for a long time but when you’re off, you’re off for a relatively long time” (M/I worker)</i></p> <p><i>“Yeah, I could never do 5 days, 8 to 4 or 9 to 5, because I’ve been on 4 cycle shift for 15 odd years and the days off you get during the week because the way the shift falls, you know you’d have to, whatever go to the bank or whatever you have to do, mow the lawn, if you have DIY jobs to do around the house, you can get them done. Because if you’re working all week long, during days, you’ve only a small space of time at the weekend to do these things” (M/I worker)</i></p>